CLAIMS

What is claimed is:

1. An optical apparatus, comprising:
   a first planar optical waveguide comprising a first waveguide core within a first cladding, an upper surface of the first cladding over the first core being substantially flat along at least a portion of the length thereof, thereby forming a first substantially flat waveguide upper cladding surface; and
   a second planar optical waveguide comprising a second waveguide core within a second cladding, an upper surface of the second cladding over the second core being substantially flat along at least a portion of the length thereof, thereby forming a second substantially flat waveguide upper cladding surface,
   the first and second planar optical waveguides assembled together with at least portions of their corresponding substantially flat waveguide upper cladding surfaces positioned facing one another, thereby positioning the first and second planar optical waveguides for optical transverse-coupling between the first and second cores along corresponding transverse-coupled portions thereof.

2. The apparatus of Claim 1, wherein the first and second planar optical waveguides are assembled together with their corresponding substantially flat waveguide upper cladding surfaces positioned against one another.

3. The apparatus of Claim 1, wherein the first and second planar optical waveguides are assembled together with their corresponding substantially flat waveguide upper cladding surfaces spaced-apart from one another.

4. The apparatus of Claim 1, wherein at least one of the first and second waveguide cores has a lateral dimension thereof that is larger than a vertical dimension thereof along a portion of the waveguide core below the corresponding substantially flat waveguide upper cladding surface.

5. The apparatus of Claim 1, further comprising:
   at least one additional area of first core material within the first cladding, the additional area of first core material forming a corresponding substantially flat

first structural upper cladding surface substantially parallel to the first substantially flat waveguide upper cladding surface; and

at least one additional area of second core material within the second cladding, the additional area of second core material forming a corresponding substantially flat second structural upper cladding surface substantially parallel to the second substantially flat waveguide upper cladding surface,

the first and second structural upper cladding surfaces being positioned against one another upon assembly of the first and second planar waveguides with the corresponding waveguide upper cladding surfaces facing one another.

6. The apparatus of Claim 5, wherein the first waveguide upper cladding surface and the first structural upper cladding surface are non-coplanar, thereby positioning, upon assembly of the first and second planar waveguides, the first and second waveguides with their corresponding substantially flat upper waveguide cladding surfaces spaced-apart from one another.

7. The apparatus of Claim 5, wherein the first waveguide upper cladding surface and the first structural upper cladding surface are substantially coplanar.

8. The apparatus of Claim 5, wherein

the first waveguide upper cladding surface and the first structural upper cladding surface are substantially coplanar;

the second waveguide upper cladding surface and the second structural upper cladding surface are substantially coplanar; and

the first and second waveguide upper cladding surfaces are positioned against one another upon assembly of the first and second planar waveguides with the first and second structural upper cladding surfaces positioned against one another.

9. The apparatus of Claim 1, further comprising:

a pair of additional areas of first core material disposed within the first cladding on opposite sides of the first waveguide core, each of the pair of additional areas of first core material comprising an elongated area running substantially parallel to and laterally spaced apart from the first waveguide core, the pair of additional areas of first core material forming a corresponding first pair of structural upper

cladding surfaces substantially parallel to the first substantially flat waveguide upper cladding surface; and

a pair of additional areas of second core material disposed within the second cladding on opposite sides of the second waveguide core, each of the pair of additional areas of second core material comprising an elongated area running substantially parallel to and laterally spaced apart from the second waveguide core, the pair of additional areas of second core material forming a corresponding second pair of structural upper cladding surfaces substantially parallel to the second substantially flat waveguide upper cladding surface,

the first and second pairs of structural upper cladding surfaces being positioned against one another upon assembly of the first and second planar waveguides with the corresponding waveguide upper cladding surfaces facing one another.

10. The apparatus of Claim 9, wherein the first waveguide upper cladding surface and the first pair of structural upper cladding surfaces are non-coplanar, thereby positioning, upon assembly of the first and second planar waveguides, the first and second waveguides with their corresponding substantially flat upper waveguide cladding surfaces spaced-apart from one another.

11. The apparatus of Claim 9, wherein the first waveguide upper cladding surface and the first pair of structural upper cladding surfaces are substantially coplanar.

12. The apparatus of Claim 9, wherein

the first waveguide upper cladding surface and the first pair of structural upper cladding surfaces are substantially coplanar;

the second waveguide upper cladding surface and the second pair of structural upper cladding surfaces are substantially coplanar;

the first and second waveguide upper cladding surfaces are positioned against one another upon assembly of the first and second planar waveguides with the first and second pairs of structural upper cladding surfaces positioned against one another.

13. The apparatus of Claim 9, wherein

the pair of additional areas of first core material are laterally spaced apart from the first waveguide core by a distance at least as large as the width of the first waveguide core; and

the pair of additional areas of second core material are laterally spaced apart from the second waveguide core by a distance at least as large as the width of the second waveguide core.

14. The apparatus of Claim 9, wherein

the pair of additional areas of first core material are laterally spaced apart from the first waveguide core by a distance sufficiently large so as to substantially avoid optical coupling between the pair of additional areas of first core material and each of the first and second waveguide cores; and

the pair of additional areas of second core material are laterally spaced apart from the second waveguide core by a distance sufficiently large so as to substantially avoid optical coupling between the pair of additional areas of second core material and each of the first and second waveguide cores.

15. The apparatus of Claim 9, further comprising embedding material substantially filling a volume between the respective upper cladding surfaces of the assembled first and second waveguides, the volume disposed between the engaged pairs of substantially flat structural upper cladding surfaces of the assembled waveguides.

16. The apparatus of Claim 9, at least one elongated area of core material having therethrough at least one gap, the gap providing a flow channel for a liquid precursor for an embedding medium to flow into and substantially fill a volume between the respective upper cladding surfaces of the assembled first and second waveguides, the volume disposed laterally between the engaged pairs of substantially flat structural upper cladding surfaces.

17. The apparatus of Claim 1, wherein index contrast between at least one of the first and second cores and the corresponding cladding is less than about 5%.

18. The apparatus of Claim 17, wherein at least one of the first and second cores comprises doped silica and the corresponding cladding comprises silica or doped silica.

19. The apparatus of Claim 17, wherein at least one of the first and second cores is less than about 1.5 μm in a vertical dimension and less than about 6 μm in a lateral dimension.

20. The apparatus of Claim 1, wherein index contrast between at least one of the first and second cores and the corresponding cladding is greater than about 5%.

21. The apparatus of Claim 20, wherein at least one of the first and second cores comprises silicon nitride or silicon oxynitride and the corresponding cladding material comprises silica or doped silica.

22. The apparatus of Claim 20, wherein at least one of the first and second cores is less than about 200 nm in a vertical dimension and less than about 5 μm in a lateral dimension.

23. The apparatus of Claim 1, wherein at least one of the first and second cladding is less than about 1 μm thick over the transverse-coupled portion of the corresponding core.

24. The apparatus of Claim 1, wherein at least one of the first and second cladding is less than about 0.5 μm thick over the transverse-coupled portion of the corresponding core.

25. The apparatus of Claim 1, further comprising at least one additional area of core material within at least one of the first cladding and the second cladding, with a corresponding area of upper cladding surface, the corresponding area of the upper cladding surface forming a flow-director for an embedding medium applied to at least one of the first and second planar waveguides.

26. The apparatus of Claim 1, further comprising embedding material substantially filling a volume between respective upper cladding surfaces of the assembled first and second waveguides.

27. The apparatus of Claim 1, wherein at least one of the first and second cores terminates at at least one end thereof, the terminating waveguide core tapering in the lateral dimension along the transverse-coupled portion thereof toward the terminated end.